Control Of *Fusarium oxysporium* and *Fusarium solani*Caused Damping-off and Root-rot Diseases On Faba Bean

Dr. Ali. A. Emhemed

Faculty of Science, Sirte University-Libya

Abstract:

This study was carried out in Sirte city in season 2013-2014. Faba bean samples were collected from different locations in Sirte Governorate, i.e. Al-Sawawa, Al-Grbiat and Abohade, the results obtained could be summarized as follow, five fungal isolates from diseased Faba bean plants were used, two *Fusarium solani*, two of *Fusarium oxysporium* and one isolate of *Pythium* sp. identification of isolate fungi were carried out using characteristics of mycelia and spores, determination of the number of pre- and post- emergence damping –off were recorded after 3 weeks from planting. Determination of the root rot disease was recorded after 7 weeks from planting. Were the occurrence of isolated fungi *F. oxysporium* and *F. solani*. The best control of disease was obtained when the use of ultraviolet Exposure period at 15 min. as well as when acetic acid at 0.6% added ,on the other side, all fungicides were effect on tested pathogenic fungi, however, *F. solani* was sensitive more than *F.oxysporium* specialized vitvax-200.

Key words: Fusaium oxysporium and Fusarium solani, Ultraviolet, acetic acid, fungicides.

1. Introduction:

Faba bean (*Vicia faba* L.) is one of the most important leguminous crops cultivated not only in Libya but also in many other countries all over the world, it is used as a human food, and for animal feeding. Also, it improves the soil by fixing atmospheric nitrogen through the root nodules. As well as, considered an economical crop due to its high protein content, balanced amino acid composition.

Faba bean plants are commonly exposed to attack by many serious soil born fungi, i.e. *Pythium* sp., *Fusarium* sp., *Rhizoctonia solani*,

(Omar, 1986, Mahmoud *et al.*, 1995, Datnoff and Sinclair 1988, Abou-Zed *et al.* 1997, Ali, 2000 and El-Wakil and Ghonin2000). Most of them cause damping- off and root rot diseases, leading to great economic losses in crop yield and quality. This study investigated the possibility of controlling of some using (ultraviolet, acetic acid and fungicides).

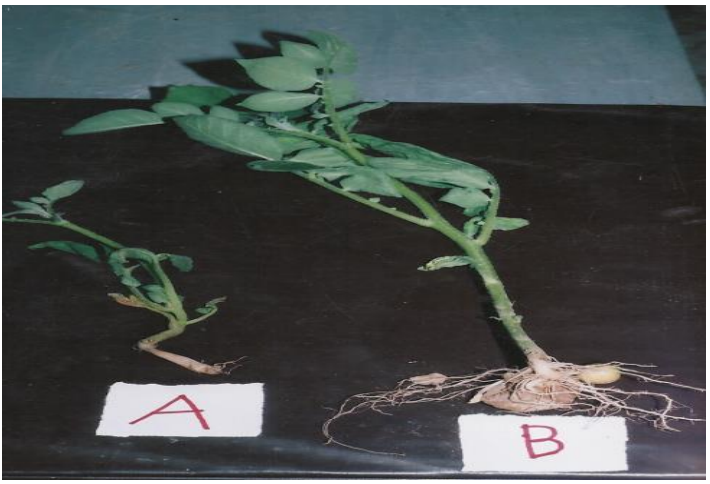

Fig.1. Compare between diseased plant (A) and healthy plant (B)

Materials and Methods.

1. Isolation, Purification and Identification:

The aim of this section was to isolate and identify fungi associated with damping- off and root rot symptoms of Faba bean. Samples were collected from different locations in Sirte Governorate, i.e. Al-Sawawa, Al-Grbiat and Abohade.

Discolored roots were cut into small parts, surface sterilized by immersing them in 1% sodium hypochlorite for 2 minutes and then washed several times in sterilized water; Surface sterilized root and were dried between two sterilized filter papers then transferred to fungal medium (3 pieces / dish). Plates were incubated for 7 days at 30±2ºC. Any grow fungi was transferred to new dish. Pure cultures were kept on slant media at 4ºC for further studies. Identification of the isolated fungi was carried out using based on the characteristics of mycelia and spores, according to Gillman1957, Clements and Shear 1957, Barnett 1960, Barnet and Hunter 1998, Booth 1971 and 1977 and Domsch *et al.* 1980.

2- Pathogenicity test:

Throughout this study five fungal isolates from diseased Faba bean plants were used, two *F. solani*, two of *F. oxysporium* and one isolate of *Pythium* sp. These isolates were individually tested for their pathogenicity on Geza 3 cultivar Broad bean plants under greenhouse conditions. Determination of the number of pre- and post- emergence damping –off and healthy survival plants were recorded after 3 weeks from planting. Determination of the root rot disease were recorded after 7 weeks from planting, SEVERITY INDEX (DSI) was carried out based on a scale from 0 (non- visible damage) to 5 (completely destroyed roots) as described by Salt (1981). Percentage of root rot was recorded according to the formula

$$\% \text{ Root- rot} = \frac{\text{No. of infected plants}}{\text{Total plant number}} \times 100$$

3. Diseases control:

3.1. Effect of ultraviolet (uv) on fungal growth:

Fungal media dishes were centrally inoculated with 3 mm. diameter discs from active culture of *F. solani* and *F. oxysporium* (culture) were exposed to uv radiation at 360 nm. For three exposure intervals, i.e. 5,10 and 15 min. The plates were approximately 15cm from the light source (De Cal and Melgarejo 1999, Ali 2007). Four replicates per treatments were prepared. Dishes incubated at 30±2ºC and linear growth was recorded 7 days after inoculation.

3.2. Effect of acetic acid on mycelia growth:

Effect of different concentrations (0.0, 0.2 and 0 .6%) of acetic acid on the linear growth of the tested pathogenic fungi (*F. solani* and *F. oxysporium*).

Acetic acid was added at the tested concentration to media before solidifying. the treated medium was poured in petri dishes (5 cm. in diameter) at the rate of four dishes for each concentrations. The dishes were inoculated in the center with an equal discs (3 mm in diameter) then incubated at 30±2ºC for 7 days. Linear growth of tested fungi was recorded after covered growth control.

3.3. Effect of some fungicides on fungal growth:-

Effect of different concentrations (0.0, 50,100,200 and 300 PPM.) of some fungicides (Topsin-M70, Vitavax-200 and Mancozeb) on the linear growth of the inestigated species fungi were tested under laboratory conditions. Concentrations of each fungicide were added to PDA medium before solidifying. The linear growth of the tested fungi was measured in cm. after 7 days.

Statistical Analysis:

The statistical analysis was carried out according to the method described by Snedecor and Cochran (1982)

Results and Discussion:

1- Isolation, Purification and Identification of the causal organisms:

F. oxysporium, F. solani and *Pythium* spp. were the occurrence of isolated fungi from random root samples collected from different locations.

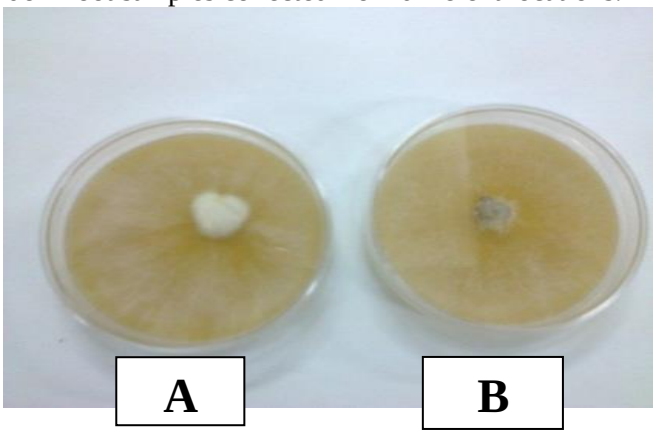

Fig.2. A= *F. oxysporium* and B= *F. solani*

2-Pathogenicity Experimental:

Pathogenicity experiments were carried out in order to evaluate the pathogenic properties of the isolate fungi. The broad bean, Geza 3 cultivar were inoculated with each of the five tested isolate. Preliminary pathogenicity tests indicated that all the tested isolates showed pre-and post-emergence damping-off and root rot symptoms on all the tested plants.

Fig 3. Show symptoms root – rot on faba bean plant infected by *F. oxysporium* (A) and *F. solani* (B)

Table (1). Percentage of pre- and post- emergence damping- off and root-rots diseases and survival plants

Tested isolates	*PRD	PTD**	Root-rot	Healthy plants
***F. solani*1**	14.16	5.37	7.25	71.24
***F. solani*2**	32.29	9.25	11.92	46.54
***F. oxysporium*1**	19.56	11.01	9.51	59.92
***F. oxysporium*2**	14.52	8.87	6.20	70.41
***Pythium* sp.**	29.32	8.19	5.73	55.76
Control	2.06	0.0	1.41	96.53
Mean	19.31	7.11	7.00	66.73
L.S.D.0.05 Fungi (F)		1.62	2.19	2.86
L.S.D.0.05 disease (D)		1.24	1.83	1.74
L.S.D.0.05 F.D		1.93	3.27	3.95

***PRD** = pre- emergence damping –off
****PTD** = post- emergence damping –off

From data in Table (1) and illustrated fig.1 the following could be concluded:

a- (PRD):

all tested isolates significant diseases incidence, the infection percentage different according to the tested isolate. Infection were higher in case *F. solani* 2, *Pythium* sp. and *F. oxysporium* (32.29, 29.32 and 19.56) respectively compared with control experiment (2.06) .the least virulent isolate were *F.oxysporium* 2 and *F. solani*1 (14.52and 14.16).

b. (PTD):

The highest levels of infection percentage values (PTD) were obtained with *F. oxysporium* 1 and *F. solani* 2 (11.01 and 9.25). on the other side , from data in Table 1 indicated were the most virulent isolate in that , *F. solani* 1, *Pythium* sp. and *F. oxysporium* inducing PTD.

C. Root – rot:

Results were presented in Table (1) and fig. 1 . data indicated that all the tested isolated fungi , showed disease incidence on all tested pathogenic fungi. However, the highest percentage of root-rot disease incidence were isolate of *F. solani* 2 and *F. oxysporium* 1 (11.92 and 9.51) on the other side, the least isolate were *Pythium* sp. , *F. oxysporium* 2 and *F. solani* 1 (5.73, 6.2 and 7.25).

3-Control Experimental:

3.1. Effect of ultraviolet (uv) on fungal growth:-

Data in Table (2) and fig.2 illustrated that showed decrease rate when exposed to UV irradiation compared with control. However, the longer the exposure time,

Table (2): Effect of ultraviolet radiation treatment on the mycelial growth of the tested pathogenic fungi

Exposure period (min.)	Tested pathogenic fungi		Mean
	F.solani	***F.oxysporium***	
00.	5.0	5.0	5.0
5	4.4	3.9	4.1
10	3.2	3.6	3.4
15	2.3	3.3	2.8
Mean	73.	3.9	3.8
L.S.D.at 0.05 for:	(UV) 0.134	Fungi (F) 0.171	F.UV0.198

the higher were the growth reduction rate values. *F. solani* proved to be the most sensitive to uv treatment compared with *F. oxysporium* some publishers

(Ranganna *et al.*, 1995, Ranganna *et al.*, 1997, El-Bazza *etal.* 1996, Nigro *et al.*2000, Stevens 2003 and Ali 2007) reported that, treated by ultraviolet was good control for different pathogenic fungi.

3.2. Effect of acetic acid on mycelia growth:

At 0.2% concentration of acetic acid was reduced the mycelial growth *of F. oxysporium*, but the *F. solani* was tolerant on the other side. At 0.6% all tested fungi were sensitive and was gave high inhibition fungal growth.

Table (3): Effect of acetic acid at different concentration on Average growth diameters (cm.) mycelia growth of the tested fungi

	Concentrations (%)			
	0.0	.20	.60	Mean
F. solani	5	3.9	2.4	3.7
F. oxysporium	5	2.2	1.9	3.0
Mean	5	3.0	2.1	

L.S.D.at 0.05 for:	Fungi (F) 0.146	Conc. (C) 0.124	FXC 0.031

where reduction in growth compared with control attained maximum percentage [*F. solani* (52%), followed *F. oxysporium* (62%)]. These results were in agreement with obtained by (Sholberg *et al.* 1998, Morsy *et al.* 1999, Morsy *etal.* 2000a.b, Mamta *et al*. 2005, Abd-All 2005, Ali 2007 and Francots. 2011.

3.3. Effect of some fungicides at different concentrations on fungal growth:

Data in Table (4) illustrated that , all the tested fungicides, generally, significantly reduced the mycelia growth of tested fungi at all the tested concentrations, however, *F. solani* was sensitive more than *F. oxysporium* vitvax-200 was more effective against both of the tested fungi, followed by Topsin –M70 and mancozeb. These results support previous puhhshed results obtained by Bokshi *et al.*, 2003, Bernat, 2004 and Ali 2007).

Table (4): Effect of some fungicides at different concentrations on the mycelial growth Linear growth (cm.) of tested fungi

Fungicide	**Conc.(ppm)**			
		F. oxysporium	***F. solani***	**Mean**
Topsin M-70	0.0	5.0	5.0	5.0
	50	5.0	4.6	4.8
	100	4.7	4.1	4.4
	200	4.2	3.6	3.9
	300	4.0	2.2	3.1
	Mean	4.5	3.9	4.2
Vitavax-200	0.0	5.0	5.0	5.0
	50	5.0	3.8	4.4
	100	4.3	2.7	3.5
	200	3.6	1.9	2.7
	300	2.2	1.6	1.9
	Mean	4.0	3.0	3.5
Mancozeb	0.0	5.0	5.0	5.0
	50	4.5	4.8	4.6
	100	3.3	4.3	3.8
	200	2.6	3.6	3.1
	300	2.9	2.3	2.1
	Mean	3.6	4.0	3.8
Average	**Mean**	4.0	3.6	3.8

L.S.D.at 0.05 for:

Fungi (F)	Fungicide (Fu)	Conc. (C)	F.Fu	F.C	Fu.C.	F.Fu.C
0.1	0.12	0.12	0.03	0.05	0.06	0.13

Conclusion

The results obtained could be summarized as follows:

Of *F . oxysporiumm, F. solani* and *Pythium* spp. were the most frequently isolated fungi from diseased root faba bean plants, the lowest percentage of faba bean damping-off and root- rot diseases incidence when infected by *Pythium* spp. , however, disease increased when infected by *F. oxysporium* and *F. solani*.

The best disease control were obtained after treating by ultraviolet and adding acetic acid at 0.6%. On the other side, vitavax-200 was the best fungicide best disease control, on the othe side, *F. solani* was sensitive to treated by fungicides more than *F. oxysporium*.

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